

WE CLAIM:

1. A method for distinguishing between two or more temporally overlapping touch inputs in a touch screen system comprising:

5 (a) measuring signals caused by the two or more touch inputs;

(b) measuring positional data for the touch inputs;

(c) determining whether any of the signals exceeds a minimum threshold for a single touch input;

10 (d) determining whether any of the signals exceeds a maximum threshold for a single touch input; and

(e) calculating and reporting to the touch screen system a touch location using positional data that corresponds to any of the signals that exceeds the minimum threshold but that does not exceed the maximum threshold.

15 2. The method of claim 1, further comprising the step of subtracting the positional data used in step (e) from positional data corresponding to any of the signals that exceeds the maximum threshold to calculate a touch location unreported by step (e).

20 3. The method of claim 1, further comprising determining which portions of the total signal correspond to touch-down, hold, and lift-off events of the two or more overlapping touch inputs.

25 4. The method of claim 1, further comprising the step of calculating and reporting a touch location when two sequential performances of steps (a) through (e) both result in no touch location being reported due to the signals exceeding the maximum threshold.

30 5. The method of claim 1, wherein at least one of the minimum and maximum thresholds are determined from a calibration step.

6. The method of claim 1, wherein the minimum and maximum thresholds comprise preset values.

7. The method of claim 1, wherein at least one of the minimum and 5 maximum thresholds are updated during normal use of the touch screen system.

8. The method of claim 1, wherein at least one of the minimum and maximum thresholds are updated based on user touches within a designated region.

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9. The method of claim 1, wherein different minimum and maximum threshold values can be assigned to different users.

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10. The method of claim 1, wherein the total signal is a total electrical current measurement.

11. The method of claim 1, wherein the touch screen system comprises a capacitive touch screen.

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12. The method of claim 1, wherein the touch screen system comprises a resistive touch screen.

13. The method of claim 1, wherein the touch screen system comprises a force-based touch screen.

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14. The method of claim 1, wherein a touch location is reported in step (e) only if the touch location calculated in step (e) is contained within an area of the touch screen designated as a valid touch area.

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15. A touch screen system comprising:
a touch panel for measuring touch-based user input signals;

an information display disposed for viewing through the touch panel; and

a processing unit for discriminating the touch-based user input signals to determine which signals correspond to temporally overlapping 5 individual touch inputs by comparing a signal magnitude to one or more predetermined threshold values and by performing one or more of monitoring a signal magnitude rate of change, monitoring a rate of change of calculated touch position, monitoring proximity of touch position to one or more designated active areas, or monitoring proximity of touch position to one or more designated 10 regions of higher double touch probability.

16. The touch system of claim 15, wherein the touch panel is a capacitive touch panel.

15 17. The touch system of claim 15, wherein the touch panel is a resistive touch panel.

18. The touch system of claim 15, wherein the touch panel is a force-based touch panel.

20 19. The touch system of claim 15, wherein the touch panel is a surface acoustic wave touch panel.

25 20. The touch system of claim 15, wherein the touch system is part of a game system that allows at least two players to use the touch panel.

21. A method for distinguishing temporally overlapping touch inputs in a touch screen system comprising:

30 repeatedly measuring a signal caused by one or more touch inputs; monitoring rates of change of the signal;

correlating the rates of change of the signal with touch-down, hold, and lift-off events, to determine a sequence of said events;

using the determined sequence of said events to determine a temporal ordering of the one or more touches;

5 calculating a touch location of at least one of the one or more touches given the determined sequence; and
reporting the touch location.

22. The method of claim 21, further comprising the step of
10 determining that said touch location resides in an area of the touch screen
designated as an active area.

23. The method of claim 22, wherein the active area corresponds to a
displayed icon.

15 24. The method of claim 21, wherein the step of reporting said touch
location is not performed for a calculated touch location if said touch location has
moved more than a predetermined distance from a preceding calculated touch
location.

20 25. The method of claim 21, further comprising the step of comparing
a magnitude of the signal to a minimum threshold value and a maximum
threshold value so that the reporting step is only performed for touch locations
that correspond to signals whose magnitude exceeds the minimum threshold but
25 does not exceed the maximum threshold.

26. A method for distinguishing valid touch inputs among temporally
overlapping touch inputs in a touch screen system comprising:

30 measuring a predetermined number of touch signals, each
measurement taken at a predetermined time interval, each time interval being
shorter than an expected touch input hold duration;

calculating a signal parameter for each of the signals;
calculating a touch location for each of the signals that is within a
predetermined range; and
5 reporting a touch position to the touch screen system for any of the
calculated touch locations that is less than a predetermined distance away from
any of the other calculated touch locations.

27. The method of claim 26, further comprising the step of
determining that said touch location resides in an area of the touch screen
10 designated as an active area.

28. The method of claim 27, wherein the active area corresponds to a
displayed icon.

15 29. A method for distinguishing valid touch inputs among temporally
overlapping touch inputs in a touch screen system comprising:
measuring a predetermined number of touch signals, each
measurement taken at a predetermined time interval, each time interval being
shorter than an expected touch input hold duration;
20 determining a signal parameter for each of the signals;
calculating a touch location for each of the signal parameters that
is within a predetermined range;
adjusting the predetermined range and repeating the calculating
step for any touch location that is within a designated region corresponding to a
25 higher probability of double touch events; and
reporting a touch position to the touch screen system for the
calculated touch locations.

30. A method for distinguishing valid touch inputs among temporally
overlapping touch inputs in a touch screen system comprising:
determining a total signal from a set of measured touch signals;

calculating a touch position from the set of measured touch signals when the total signal exceeds a minimum threshold value;

5 performing one or both of

(a) setting a test parameter for rate of change of total signal magnitude based on where the calculated touch position is located, and comparing the total signal magnitude to other recently measured total signal magnitudes to determine whether the test parameter for rate of change of total signal magnitude is satisfied,

10 (b) setting a test parameter for rate of change of position based on where the calculated touch position is located, and comparing the touch position to other recently measured positions to determine whether the test parameter for rate of change of position is satisfied; and

15 when the applicable test parameter or test parameters is satisfied, reporting the touch position when the total signal does not exceed a maximum threshold.

31. The method of claim 30, wherein the maximum threshold is set
20 based on location of the touch position.

32. The method of claim 30, wherein the touch position is reported only if the touch position corresponds to an designated active area.

25 33. A method for distinguishing valid touch inputs among temporally overlapping touch inputs in a touch screen system comprising:

measuring a predetermined number of touch signals, each measurement taken at predetermined time intervals, the time intervals being shorter than an expected touch input hold duration;

30 associating a signal parameter with each of the signals;

calculating a touch location for each of the signals whose associated parameter is above a minimum threshold but below a maximum threshold; and

5 reporting a touch position to the touch screen system for any of the touch locations calculated in the calculating step.

34. The method of claim 33, wherein the signal parameter is a total signal magnitude.

10 35. The method of claim 33, wherein the signal parameter is a signal magnitude rate of change.

36. The method of claim 33, wherein the signal parameter is a rate of change of position.

15 37. The method of claim 33, wherein the signal parameter is proximity to an icon placement.

38. A method for distinguishing phantom touch positions from valid 20 touch positions during a double touch event in a touch screen system comprising: independently measuring an X-coordinate position for each touch in the double touch;

independently measuring a Y-coordinate position for each touch in the double touch;

25 determining a rate of change of magnitude of a measured signal corresponding to each X-coordinate position and each Y-coordinate position;

matching X-coordinate positions with Y-coordinate positions based on similar rates of change; and

30 reporting the matched X, Y coordinates as the valid touch positions.